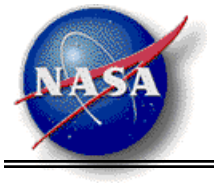
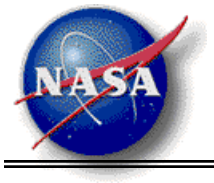


The Future of Product Line Development at NASA

Robyn Lutz
Jet Propulsion Lab/Caltech & ISU

SAS'06 Panel Discussion

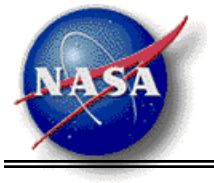


Product line

A software product line is a set of software systems developed by a company that share a common set of core requirements but differ according to a set of allowable variations.

Examples:

- Satellite constellations (Earth Observing System)
- Ground systems (station antenna software)
- Crew/ground displays (similar look & feel)
- Interferometer fringe tracking software
- Robotic lunar fleet
- Wide range of COTS products used in NASA systems (EEPROM, web monitoring, etc.)



Product line advantages

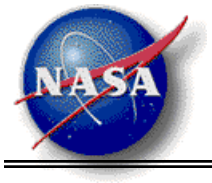
JPL

Faster development and system integration

Reduced time to market

Exploit commonality to get more reliable systems

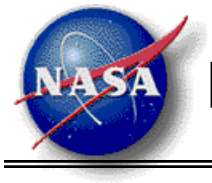
- Requirements: shared, optional, alternatives
- Architecture: configuration of components and connectors
- Decision model: set of choices for each system
- Component and middleware code
- Test suites
- Safety and performance analyses



Product Line Development at NASA

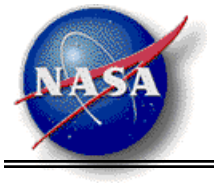
JPL

- NASA builds product lines (but usually doesn't recognize that)
- NASA will build more product lines in the future (and is beginning to recognize that; note SEW'05 Gomaa tutorial)
- Software product-line engineering is a mature technology
  - SEI led the way; several good textbooks on product lines
  - Widely used in industry (Siemens, Avaya, Guidant, Rockwell Collins, Nokia, Daimler-Chrysler, ESA, etc.)
  - Has its own conference (SPLC since 2000, PFE since 1996)
  - NASA suppliers already use product-line technology
- NASA can benefit from widespread adoption of software product-line engineering practices



Product lines: measured against Tim's criteria

- *Broad:* across systems, NASA faces issues of how to leverage commonality & manage variations in similar but non-identical systems
- *Far-reaching:* open research problems in architecture, requirements, performance & safety analysis, IV&V, testing
  - Research needed into V&V techniques to assure that delivered software for a new system meets product-line specs
- *Useful products:* good results shown in industry from even partial tech transfer of product-line techniques
- *Short-term benefit:* cost savings as similar systems are developed, practical framework for integration of evolving systems



Summary

We propose to identify, investigate, evaluate and apply product-line engineering techniques to NASA product lines in order to improve the timeliness, robustness and effectiveness of these future systems.